



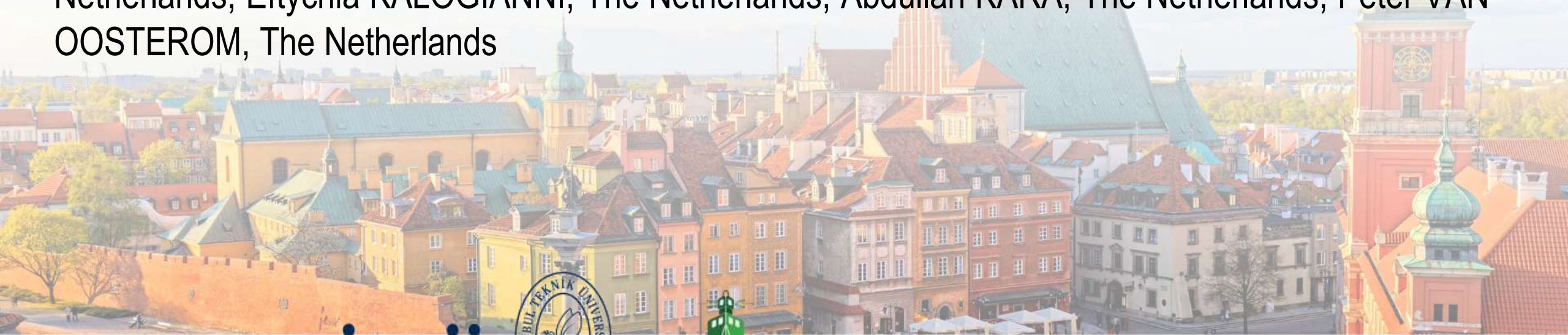
XXVII FIG CONGRESS

11-15 SEPTEMBER 2022
Warsaw, Poland

Volunteering
for the future –
Geospatial excellence
for a better living

3D Registration of Apartment Rights using BIM/IFC: Comparing the cases of the Netherlands, Saudi Arabia, and Turkey

Dogus GULER, Türkiye, Abdullah ALATTAS, Saudi Arabia, Marjan BROEKHUIZEN, The Netherlands, Eftychia KALOGIANNI, The Netherlands, Abdullah KARA, The Netherlands, Peter VAN OOSTEROM, The Netherlands



ORGANISED BY



PLATINUM SPONSORS



Introduction & Motivation

- Increased complexity of the built environment (complex and high-rise buildings)
- Improving the LASs to meet the needs (3D Cadastre \longrightarrow 3D Land Administration)
- The need for 3D delineations due to insufficiency of 2D representations
- Architecture, Engineering, Construction, and Owner Operator (AECOO) sector
- Growing interest in Building Information Modeling (BIM) (designing buildings digitally, detailedly, and collaboratively) (The Netherlands, Sweden, Australia, Saudi Arabia, and Turkey)
- Land Administration Domain Model (LADM) & Industry Foundation Classes (IFC)

Introduction & Motivation

- To reveal whether a basis for the modeling approach can be provided for the 3D depiction of condominium rights using BIM/IFC models of the apartments
- To unveil how a modeling approach based on the use of BIM/IFC models for the 3D representation of both legal spaces and physical building elements, as well as the attached RRRs on the buildings can be developed
- The consensus about the conceptual basis for 3D modeling of condominium rights by benefiting from the reuse of BIM/IFC models
- To create awareness in the land administration-related sectors (including AECOO and spatial planning) about 3D legal spaces and the attached RRRs on the buildings

Legal Basis of the Countries (The Netherlands)

- Apartment rights is described in the Dutch Civil Code
- A share in an asset that gives the exclusive right to use certain parts of the building as a separate private unit
- Established with a notarial deed
- Consists of a written part in which a written description of the parts of a building on which the apartment right is formed
- Refer to a drawing that is attached to the deed
- 2D drawing with a graphical representation of the boundaries

Legal Basis of the Countries (Saudi Arabia)

- Deed registration document differs according to the property type
- Submitting a request to the Ministry of Housing, technical check using information from the Ministry of Municipal and Rural Affairs, sending request to the Ministry of Housing, notifying the Ministry of Justice to issue a new deed registration document
- Specific conditions must be presented on the property in order to apply the subdivision processes
- Private spaces (**belong to a specific unit**), exclusive common spaces (**exclusively available to a limited number of units**), and common spaces (**the shaft, roof, elevator, stairwell, setbacks, parking**)

Legal Basis of the Countries (Turkey)

- The main legislative document that defines the RRRs with respect to condominiums (Condominium Law No.634 (1965))
- Independent ownership rights can be established by the owner or joint owners on the different units such as storey, apartment, office, store, cellar, and storage
- A condominium owner can have the right to use the condominium itself and spaces that are outside of the condominium as well
- Annexes (coal cellar, water tank, garage, electric meter box, or toilet)
- Shared facilities and spaces (Main walls, beams, columns, curtain walls, floors, ceilings, patios)

LADM-Based Country Profiles and Related Developments (The Netherlands)

- Annex D of ISO 19152:2012 LADM
- Dutch LADM-based country profile focusing only on the ‘Survey and Representation’ sub-package, named the Netherlands Survey and Representation Data Model (NLSRDM)
- ISO 19152 LADM Valuation Information Model for the Netherlands
- ‘Cadastral Map Next’ program, a new data model that have connected points to describe the geometry and connect the measurement data to the map data
- Using the BIM/IFC models as a data source for the 3D registration of apartment rights

LADM-Based Country Profiles and Related Developments (Saudi Arabia)

- 2D-based country profile, updating to include all of the additional attributes
- The 3D depiction of legal space ownership has been proposed by applying the same laws and regulations as Saudi Arabia's existing building unit subdivision processes
- Additional attributes for the ownership of the spaces and construction components
- SA_ConstructionElement (SA_Wall, SA_Column, and SA_Slab)
- SA_BuildingUnit (SA_MainUnit, SA_AmenitiesUnit, SA_SharedAreaUnit)
- SA_BuildingUnit class: two '+/-' associations with the classes SA_Wall, SA_Column, and SA_Slab to indicate the areas placed to the right and left of the building element

LADM-Based Country Profiles and Related Developments (Turkey)

- TR_Party providing the attributes of different parties: [IfcActor](#)
- TR_BAUnit expressing the registration object: [IfcZone](#)
- TR_Parcel utilizing to store the required attributes for land parcels: [IfcSite](#)
- TR_Building: [IfcBuilding](#) storing the details of the buildings in the IFC schema
- Aggregation relationships between TR_CondominiumUnit: [IfcZone](#) and TR_MainUnit, TR_SharedFacility, and TR_Annex classes: [IfcSpace](#)
- TR_BuildingElement providing attributes to model which condominium has the right to use: IFC entities such as [IfcWall](#), [IfcSlab](#), [IfcColumn](#), and [IfcWindow](#)

Comparison of Legal and the Countries (Legal Aspects)

- All three countries utilize the cadastral system that is based on 2D depiction
- The Netherlands and Turkey have similar ownership descriptions in terms of the condominium rights
- Saudi Arabia differs even a little from these countries because it has **exclusive common ownership** as well
- The **exclusive common ownership** is applied to the walls that are located between two condominiums (**Saudi Arabia**)
- The Netherlands and Turkey share a common approach since the nature of the boundaries is not defined legally

Comparison of Legal and the Countries (Legal Aspects)

- In the case of Saudi Arabia, different private units have the right to use on different faces of the construction elements such as walls
- In Turkey, the condominium plans that show the locations of each condominium in the building are prepared as 2D drawings
- The characteristic of the condominium rights differentiates slightly in Turkey from the other two countries because it is stated in the Condominium Law that the condominium right is a special right that is related to **land share** and the **common places** in the real estate

Comparison of Legal and the Countries (Technical Aspects)

- In the case of the Netherlands, utilizing the [lfcSpace](#) for depicting the legal spaces within buildings is determined as adequate because there is no legal obligation to provide the nature of the structural elements such as walls
- The walls can be modeled such that they are enriched with the ownership information by means of adding the suitable properties
- The structural elements such as walls, slabs, and columns are modeled in a way that contains the different ownership types namely [private](#), [common](#), and [exclusive common](#) in the case of Saudi Arabia because the ownership information regarding such elements is required on the legal basis

Comparison of Legal and the Countries (Technical Aspects)

- In Turkey's case, different IFC entities such as [lfcWall](#) and [lfcColumn](#) are used to model condominium rights since the legal basis in the country provides that several structural elements within buildings can be subject to condominium rights
- For three countries it is enabled to model of [annexes](#), [common areas](#), and [main units](#) as well
- While [lfcSpace](#) is only used to model legal spaces in the case of the Netherlands by importing related information to the spatial database, the [lfcZone](#) entity is benefited in the cases of Saudi Arabia and Turkey in order to group legal spaces for annexes and common areas that the specific condominium has right to use

Comparison of Legal and the Countries (Technical Aspects)

- In Saudi Arabia's case, the surfaces that can be subject to different ownership types are modeled using several attributes that can be attached to IFC instances of related construction elements
- In the case of Turkey, construction elements can be modeled based on the ownership type, namely common and private because the ownership information based on the surfaces of the construction elements is not defined in the laws

Conclusions

- There is a strong relationship between the building/construction permitting and registration of apartment rights (from the cases of Saudi Arabia and Turkey)
- The opportunity for exploiting BIM models in cadastral registration arises from the use of the BIM technique for designing buildings
- BIM models that will be used for the registration of apartment rights should be in as-built form
- The paramount issue for the reuse of the BIM models is that these models should have adequate information for the 3D registration of apartment rights

Conclusions

- The easiest way is to **enrich the IFC data** by adding property sets and properties regarding the RRRs associated with the condominiums
- The **national data specifications** with respect to the BIM models in terms of the apartment rights are of great importance to ensure sufficient data source
- BIM models should have **spaces** that correctly represent the legal counterparts of the condominium units
- The **guidelines** that express how to model legal spaces and their attributes regarding RRRs can be enabled to different stakeholders such as architects

Acknowledgements

- The work of D.G. is supported by the FIG Foundation PhD Scholarship and the Scientific Research Projects Department of Istanbul Technical University (Project Number: MDK-2019-42092)



XXVII FIG CONGRESS

11-15 SEPTEMBER 2022 Warsaw, Poland

*Volunteering for the future –
Geospatial excellence
for a better living*

Thank you for your attention

ORGANISED BY



PLATINUM SPONSORS

